Code : 031616

B.Tech 6th Semester Exam., 2019

UTILIZATION OF ELECTRICAL POWER

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are ***NINE*** *questions in this paper.*

(iii) Attempt ***FIVE*** *questions in all.*

(iv) Question No. ***1*** *is compulsory.*

1. Choose the correct answer of the following (any *seven*) : 2×7=14

(a) Which one of the following methods is not preferred for welding of chromium molybdenium steels?

(i) Oxyacetylene welding

(ii) Resistance welding

(iii) Thermit welding

(iv) Submerged welding

(b) The power factor of a spot welding machine is expected to be around

(i) unity

(ii) 0·8 lag

(iii) 0·3 to 0·5 lag

(iv) 0·8 lead

(c) A schedule speed of 45 kmph is required between two stops 1·5 km apart. What would be the maximum speed of the vehicle if station stop time is 20 sec. $\alpha = 3 \cdot 2$ and $\beta = 2 \cdot 4$?

(i) 84 kmph

(ii) 74 kmph

(iii) 94 kmph

(iv) 64 kmph

(d) The compensating winding in the a.c. series motor is provided

(i) for better performance

(ii) to neutralize armature reaction

(iii) for better commutation

(iv) Both *(ii)* and *(iii)*

(v) All of the above

(e) Kando system at the first is developed in which country?

(i) Belgian Congo

(ii) Germany

(iii) Hungary

(iv) Scandinavia

(f) For suburban railway service, which of the following power supplies is used?

(i) DC system

(ii) 1-phase a.c. system

(iii) 3-phase a.c. system

(iv) Composite system

(g) In case of 3000 V d.c. system the substations are located apart

(i) 30–40 km

(ii) 12–30 km

(iii) 50–80 km

(iv) 40–50 km

(h) The weight of the copper required per one km track for a.c. system is

(i) 1600 kg

(ii) 800 kg

(iii) 1200 kg

(iv) 3000 kg

(i) Pantograph collector is used in railways where the train runs at 100 to 130 kmph. Which among the following is true about pantograph collector?

(i) It is unidirectional

(ii) The erection of the overhead network is complicated

(iii) Its height cannot be varied

(iv) None of the above

(j) 25 kV, 50 Hz, 1 – Φ is used for supplying power to the locomotives throughout India except which zone?

(i) West

(ii) East

(iii) North

(iv) South

2. (a) What are the different types of non-oxidant heating materials? Mention their temperature ranges. 6

(b) A 1-Φ, 20 kW, 230 V resistance oven employs nickel chrome strip of 25 mm thick for its heating elements. If the wire temperature is not to exceed 1200 °C and the temperature of the charge is to be 700 °C, calculate the width and length of the wire. Assume the radiating efficiency as 0·6 and emissivity as 0·9. Determine also the temperature of the wire when the charge is cold. 8

3. (a) Mention the various electrodes used in welding process along with their temperature ranges. 7

(b) What is multi-spot welding process? Explain the process with neat schematic diagram. 7

4. (a) Define the following terms used in illumination engineering design : 8

(i) Reflection factor

(ii) Absorption factor

(iii) Waste light factor

(iv) Depreciation factor

(b) In a streetlighting, two lamps are having luminous intensity of 300 candela, which are mounted at a height of 6 m and 10 m. The distance between lampposts is 12 m. Find the illumination, just below the two lamps. 6

5. (a) A 250 ton motor coach driven by four motors takes 20 seconds to attain a speed of 42 kmph, starting from rest on an ascending gradient of 1 in 80. The gear ratio is 3·5, gear transmission efficiency 92%, wheel diameter 92 cm, train resistance 40 N/ton and rotational inertia 10% of the dead weight. Find the torque developed by each motor. 7

(b) Write the desirable electrical and mechanical properties of traction motors. 7

6. (a) Explain the wiring diagram of a single tube light controlled by a switch. 7

(b) A light and alarm signal are to be provided by which an officer, by pressing a NC push button, sends a

light and alarm signal to his PA's room. The bell and the signal lamp are to operate on the supply mains whereas the push button is to operate on 12 V supply. Design the circuit and draw the schematic and wiring diagram in single line and multiline representation. 7

7. *(a)* Describe the methods of transition of series to parallel in d.c. motors. 7

(b) Compare the DC series motor with AC series motor w.r.t. different characteristics. 7

8. *(a)* Explain the various forced cooling methods. 7

(b) A laminated plywood board 40 cm × 25 cm × 1·8 cm is to be heated from 25 °C to 160 °C in 12 minutes, using 25 MHz supply, specific heat of wood is to be taken as 0·32, density is 0·6 g/cm^3, relative permittivity of wood is 6 and power factor 0·05. Find the supply voltage, power required and current drawn. Take the efficiency of the process as 75%. 7

9. *(a)* What do you understand from stroboscopic effect in fluorescent lamp? 7

(b) Describe the process of ultrasonic welding with neat diagram and mention any three of its applications. 7

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